Q#1a. Write a code that reads an integer. If the integer is positive, the code should count down to zero; otherwise counts up to zero. For example, if the user enters 5, the output should be 5 4 3 2 1 0, and if the input is -4, the result should be -4 -3 -2 -1 0.

```
def count_to_zero(n):
    if n >= 0:
        while n >= 0:
            print(n)
            n -= 1
    else:
        while n <= 0:
            print(n)
            n += 1

num = int(input("Enter an integer: "))
count_to_zero(num)
```

```
Enter an integer: -5
-5
-4
-3
-2
-1
0
```

1b. Write a code to find the volume of a sphere rounded to the nearest hundredth. The volume of the sphere is $43\pi r3$, where r is the radius of the sphere. Your code should receive the value of r from the user as the only input.

For example, if the user enters the radius as $6m$, the output would be $904.78m3$

```
import math

def sphere_volume(radius):
    volume = 4 / 3 * math.pi * (radius ** 3)
    return round(volume, 2)

radius = float(input("Enter the radius of the sphere: "))
print("The volume of the sphere is:", sphere_volume(radius), "cubic units")
```

```
Enter the radius of the sphere: 6
The volume of the sphere is: 904.78 cubic units
```

Q#1c. Write a code to find the Greatest Common Divisor for two positive integers. Your code should read the two integers as input from the user.

```
def gcd(a, b):
    while b != 0:
        a, b = b, a % b
    return a

num1 = int(input("Enter the first positive integer: "))
num2 = int(input("Enter the second positive integer: "))
print("The GCD of", num1, "and", num2, "is", gcd(num1, num2))
```

```
Enter the first positive integer: 36
Enter the second positive integer: 12
The GCD of 36 and 12 is 12
```

Explanation: The formula to find the greatest common divisor (GCD) of two positive integers a and b is the Euclidean algorithm. The steps of the algorithm are as follows:

Divide the larger number a by the smaller number b to obtain the remainder r.

If r is equal to zero, then b is the GCD. Return b as the result.

Replace a with b and b with r.

Go back to step 1, and repeat the division and remainder calculation until r is zero.

The key idea behind the Euclidean algorithm is that the GCD of a and b is the same as the GCD of b and r, where r is the remainder obtained from dividing a by b. This allows us to keep reducing the problem of finding the GCD of two numbers to the problem of finding the GCD of two smaller numbers, until the GCD is found.

For example, if a is 60 and b is 48, the first step would be to divide 60 by 48 to obtain the remainder 12. Then, a is replaced with b (which is 48), and b is replaced with r (which is 12). The next step is to divide 48 by 12 to obtain the remainder 0, which means that 12 is the GCD.

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